Notes

A Million White Butterflies (Pieridae) At Ouray National Wildlife Refuge, Utah

On 8.VIII.1996 the authors visited Ouray National Wildlife Refuge, Uintah County in northeastern Utah. The 5000 hectare Refuge is located about 25 km west of Vernal. Part of the refuge is accessible by an 8 km loop road through marshes and fresh water impoundments along the Green River. Near the entrance to the loop road we noted large numbers of white butterflies (Pieridae), both Cabbage White, *Pieris rapae* Linnaeus, and Checkered White *Pontia protodice* Boisduval & LeConte, nectaring on Rabbitbrush (*Chrysothamnus nauseosus,* Pall., Asteraceae). As we continued on to the loop road the butterflies appeared extremely abundant. We estimated the numbers of white butterflies within 20 m of the road using order of magnitude categories. We classified stretches of road as having 5-50, 50-500, 500-5000, or 5000-50,000 butterflies per 100 m (column 1 in table 1). For example, we estimated between 50 and 500 individuals per 100 linear meters, along the first 1 km of road. Then after a short spell of low density, the number of butterflies increased and we began finding them nectaring on Tamarisk or Salt Cedar (*Tamarix gallica* French, Tamariaceae). A sample of 15 plants with between 10 and 40 butterflies nectaring, showed an average of 9% Checkered Whites among the more abundant Cabbage Butterflies.

As we proceeded through the marshes, we encountered many Tamarisk bushes on either side of the road, and as we turned to parallel the river, the roadside ditches were clogged with stands of American Wild Licorice (*Glycyrrhiza lepidota* Pursh, Fabaceae), in a band ranging from 10-20 m wide, occupying one or both sides of the road. At this point the butterflies were so numerous that we could only estimate them by the thousands. Some licorice plants had over 100 individuals nectaring at flower clusters partially hidden under foliage. In the densest area we used 4 spot counts (1 m radius circles) which yielded a mean of 48.3 individuals per 3.14 m^2, to validate our estimate. These yielded an estimate of 30,800 for a 100 m long segment (2000 m^2), comfortably close to the midpoint of our range (27,500). We noted whether the butterflies occurred on one or both sides of the road, and clocked distances with the odometer to estimate the length of each segment. We ended a segment at a point where the density seemed to change markedly. Table 1 shows the calculation for the 8 km route. Taking the midpoint of the estimated range for each segment (2nd column in table 1) as representative, and multiplying by the length of each road segment and the number of sides occupied by butterflies, yielded an estimate of over 1,000,000 butterflies within 20 m of the road along the 8 km route. (There were very few further away because of lack of nectar sources). We doubt that the number was less than 750,000 nor more than 1.5 million.

Although one occasionally reads about "millions" of butterflies, these usually refer to migratory movements occurring over periods of hours or days. This is by far the largest localized aggregation we have ever seen. Ironically, we were unable to identify the larval host plants that the Pierids might have been using. We observed

Table 1. Estimation of abundance of white butterflies at Ouray National Wildlife Refuge, Utah, 8 August 1996.

Range of estimate per 100 m of roadside		Midpoint value for 100 m segment[1]	Length of road segment (meters)[2]	Number of sides occupied[3]	Estimate for segment
50 –	500	275	960	1	2,640
5 –	50	27.5	320	1	88
50 –	500	275	480	1.5	1,980
500 –	5000	2750	1600	1.25	55,000
5000 –	50000	27500	2080	1.7	972,400
500 –	5000	2750	800	2	44,000
50 –	500	275	1280	2	7,040
5 –	50	27.5	960	1.5	396

Total Estimate   1,083,544

[1] This value multiplied by length of segment (column 3) and number of sides occupied (column 4), divided by 100, yielded the segment estimate in the 6th column.

[2] Converted from mileage on odometer

[3] Either one or both sides of the road were occupied by butterflies, depending mainly on distribution of *Glycyrrihiza.* For example, a value of 1.7 indicates that both sides were occupied for most of the segment.

that *P. protodice* occurred most commonly where *P. rapae* was also common. Such superabundant aggregations are probably not rare, but linear distribution along the roadside ditches afforded an unusually favorable opportunity for estimating numbers.

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